Synopsis of the thesis entitled

STUDY ON SPATIAL AND TEMPORAL VARIABILITY OF SIGNIFICANT WAVE HEIGHT OVER TROPICAL INDIAN OCEAN

By

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Synopsis

Wind blowing over the sea surface generates wind waves. They develop with time and space under the action of the wind and become huge waves called ocean surface waves. The information about waves is essential for navigation, offshore operations and coastal applications. The analysis of growing observational wave data base was begun to yield the global wave statistics and prediction needs. Several authors attempted to address the problems regarding wave measurements and prediction over Indian Ocean. The present thesis investigates the spatial and temporal variability of Significant Wave Height (SWH) over Tropical Indian Ocean (TIO) and its responsible synoptic forcing phenomena. The major data sets used for the analysis were spectral wave measurements obtained from Indian National Centre for Ocean Information Services (INCOIS) and model data from National Oceanic and Atmospheric Administration (NOAA).

The thesis was organized as seven chapters. In Chapter 1 an introduction was given on basic theories of wave generation, characteristics and measuring techniques. A detailed discussion of earlier works related to wave experiments, in situ measurements, satellite altimetry and modelling was given. The characteristics of Indian Ocean in terms of surface wind forcing and wave was discussed. A brief description about synoptic phenomena such

as monsoon, Indian Ocean Dipole (IOD), ENSO and southern ocean wind was given. In addition to the existed studies, the scope of the study and objectives were defined.

In Chapter 2 the information about the wave data sets used and their sources was given. The computational description on Indian monsoon index (IMI), Dipole mode index (DMI) and Nino index (Nino3), used for the evaluation of forcing mechanism, were provided. A brief description of Wavewatch III model and model setup used to simulate the waves was provided. Further the data analysis techniques such as EOF and statistical measures were also given.

Chapter 3 presents the analysis of spectral characteristics of waves and influence of southern winds using buoy measurements at one location off east coast of India. Sea and swell components were separated from the measured spectrum and statistics of wave parameters were computed for each season. The significant observations in the data were analyzed. The time taken by the waves generated at Extra Tropical South Indian Ocean (ETSIO) to reach the measurement location was estimated using theoretical approximation. Based on the range of theoretical approximation the lag correlation analysis was performed for each month to estimate the time lag between measured swell and ETSIO wind.

Chapter 4 is a pre-requisite for the subsequent analysis which was carried out using modeled data. In order to assess the accuracy, modeled data was validated against the in situ data collected from buoy at one location each in Arabian Sea and Bay of Bengal. Further the modeled data was also compared with satellite altimeter data. The results were discussed based on the statistical indicators such as bias, correlation coefficient, scatter index and root-mean-squared-error.

Chapter 5 presents the analysis of SWH climatology generated using Wavewatch III model data. Daily climatology of SWH was analyzed for different sectors of TIO. A

detailed discussion on spatial features of SWH climatology and its possible reasons were given for each month. Latitudinal and longitudinal transects of SWH climatology was also analyzed to identify significant features over TNIO and TSIO.

Chapter 6 presents the analysis on seasonal and annual variability of SWH and its significant spatial features. The major synoptic phenomena responsible for variability of SWH over TIO were identified using correlation and EOF analysis. Significant features of first four components of EOF analysis were discussed.

Finally, the significant results in the present study were summarized in Chapter 7. The major observations and findings were concluded.